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Literacy: the Role of Non-Cognitive Skills

Explaining the Gender Gap in Financial Literacy: the Role of Non-Cognitive Skills

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Abstract

Economic literature identifies a gender gap in financial literacy. This paper tests to what extent the gender gap is due to a misspecification problem or whether it exists because boys and girls do indeed have differing ways of acquiring financial literacy. Our estimates show that the gender gap decreases by 20 per cent when the model includes the effect of non-cognitive skills, for 15-year-old students in Spain. However, differences between boys and girls in financial literacy remain statistically significant.

Keywords: gender gap, non-cognitive factors, financial literacy

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1 Introduction

Dramatic transformations in financial markets, with complicated product offerings, together with changes in society, where people live longer and are healthier, increase individual responsibility for financial decisions. In this scenario, the consequences of an aging population cannot reach the optimum if people are unable to translate these benefits into constructing a happier and more prosperous society. Financial literacy plays a key role in helping to manage individual finances efficiently, which can improve the quality of people's lives. However, several studies reveal that the current levels of financial literacy around the world are low. In addition, one striking feature of the empirical data on financial literacy is the large and persistent gender differences across surveys and countries (Lusardi, Mitchell, and Curto, 2010; Lusardi and Mitchell, 2009; Lusardi and Tufano, 2009a, 2009b). This is a problem, since financial literacy is a key element that affects financial decision-making and economic behaviour.

To date, most of the studies on the origin of the gender gap in financial literacy focus on traditional factors (i.e. the role of financial decision-making at home, the development of financial markets, risk preferences) that may affect cognitive skills and do not take into account the potential role of non-cognitive skills in explaining the gender differences. This paper tries to shed some light on the causes of the gender gap in financial literacy, by focusing on the differences between boys and girls in the non-cognitive skills and testing whether it has a different impact on the financial literacy results. We rely on the financial literacy tests from the Programme for International Student Assessment (PISA). Hanushek and Woessmann (2011 and 2012) demonstrate that good results in the standardised tests, such as PISA, are positively associated with long-term economic growth.

Empirical research shows that women consistently emerge as a group with lower financial literacy than men. In terms of measuring, evidence based on both objective and subjective indicators shows that women have less financial knowledge than their male counterparts. Objective indicators that include basic knowledge (Lusardi and Mitchell, 2011a) and more sophisticated questions (Van Rooij *et al.*, 2011a; Lusardi and Mitchell, 2009 and Bucher-Koenen *et al.*, 2011) reveal a gender gap in financial literacy in favour of men. In addition, subjective measures, focused on self-assessed financial literacy, also reflect that the mismatch between actual and self-reported knowledge is different for women and men (Bucher-Koenen *et al.*, 2014). Specifically, women assign themselves lower scores than men.¹

Bucher-Koenen *et al.* (2011) show that differences between men and women can be only partially explained by socioeconomic characteristics. After controlling for marital status, age, education and income, the gender gap decreases considerably; in particular, by 12 per cent in the US, 40 per cent in Netherlands and 50 per cent in Germany. Fonseca *et al.* (2010) find, for adults in the US, that the gender gap decreases by 25 per cent when including covariates such as marital status, disaggregated in several categories, and the length of time that the individual spent in that relationship. These authors find no evidence in favour of specialisation by gender for financial decision-making, which may be a potential explanation for the gender gap, but financial decision-making is sensitive to the relative education level of spouses. They suggest that women may acquire or “produce” financial literacy differently from men.² Another strand of the literature evaluates the effect of the traditional roles of women in the society. Several works focus on different age groups, mainly young people.

1: To the best of our knowledge, published evidence of a gender gap is only documented for a number of countries: US., Netherlands, Germany (Bucher-Koenen *et al.*, 2011) Sweden (Almenberg and S  ve-S  derbergh, 2011), New Zealand (Crossan, Feslier and Hurnard, 2011), Italy (Fornero and Monticone, 2011), Japan (Sekita, 2011), Australia (Agnew, Bateman, and Thorp, 2013), France (Arrondel, Debbich, and Savignac, 2013), Switzerland (Brown and Graf, 2013) and Russia (Klapper and Panos, 2011). For all these countries, apart from Russia, women have a higher number of incorrect answers compared to men. Evidence for Russia and East Germany (Bucher-Koenen and Lusardi, 2011) reveals that there is not a gender gap in these cases. People in East Germany know less about finance than people in the west but there are no differences between men and women. The financial market development may be a cause behind the gender gap.

2: Hsu (2011) finds that financial literacy is also lower among single women in charge of their own finances, which tells against the thesis that some gender differences are due to specialisation of labour within the household and that married women only accumulate financial knowledge late in life (close to widowhood).

Once again, there is evidence of a gender gap for people aged between 23 and 28 years old, despite higher education levels and labour force participation of younger women (Lusardi *et al.*, 2011), and also among high school pupils (Goldsmith and Gold, 1997; Chen and Volpe, 2002, Mandell, 2008 and Ford and Kent, 2010) and university students (Mandell, 2008). These findings suggest that gender differences are present at the start of the life cycle, since the previous works document a gender gap across all age groups. Thus, despite the changes in the roles of women in society in many areas, we still observe a gender gap in financial literacy.³ This evidence concludes that traditional explanations cannot fully account for the observed male/female knowledge gap.

Recent works focus on the importance of personality and non-cognitive skills for the personal and professional future of students (Levin, 2012). These studies associate some personality features with better academic outcomes, professional carriers and health. Borghans and Schils (2012) demonstrate that test scores on achievement tests depend on both cognitive and non-cognitive skills and decompose the test scores into two factors. The claim that the decline in test scores during the test is related to personality traits, mainly to agreeableness, and to motivational attitudes towards learning. Balart and Cabrales (2015) show that the size of the decline in the test scores is smaller for girls.

Although some papers point to non-cognitive skills, such as self-confidence, as potential explanations for observed gender differences, none of them include such factors in the analysis. Since cognitive and non-cognitive skills are not directly observable, the literature faces an identification problem. In this paper, we explore the gender gap in financial literacy from its origins and pay attention to the potential role of non-cognitive skills (i.e. self-confidence, motivation and perseverance). Our database includes several questions which allow us to differentiate between information related to cognitive and non-cognitive skills. To the best of our knowledge, existing studies are limited in terms of econometric analysis and, often, they only show differences based on descriptive or ANOVA analysis.

Given the impact of non-cognitive skills on explaining knowledge, previous models may have a problem of misspecification since they do not control for such factors. It might lead to inconsistent and biased estimates of the gender gap if these factors are correlated with gender. Unobservable factors related to non-cognitive individual characteristics may account for a part of the cognitive diversity claimed by the gender gap. We believe that testing the role of non-cognitive skills at the beginning of the life-cycle protects us from the effects of other unobservable factors, such as work type and marital status that might affect the gender gap. We focus on 15-year-old Spanish students who are at the start of the life-cycle in order to avoid, as much as possible, the effect of these unobservable factors and others (such as cultural and institutional aspects) that are stronger as people grow up and might affect differently the performance of boys and girls in financial literacy tests.

The paper is organised as follows. Section 2 presents the data and the econometric strategy. Section 3 shows the empirical results and interpretations of our estimates. Section 4 provides concluding remarks.

3: There are also studies showing that the framing of the questions may be a potential explanation for the gender gap in financial literacy. Van Rooij *et al.* (2011a) and Lusardi and Mitchell (2009) sustain that both the measurement errors and framing of the questions may differ by gender, and also prove that women are more sensitive to changes in the wording of the questions (Lusardi *et al.*, 2012).

2 Data and Econometric Strategy

A. Data

The PISA programme conducted in 2012 includes the assessment of competence in financial literacy. Financial PISA begins with the specific purpose of assessing the literacy and financial abilities of 15-year-old students.⁴ This survey intends to measure financial knowledge by the scores in a test of financial topics. Table A1 in the Appendix shows the questions from which the necessary information has been extracted.

Our study focuses on young people living in Spain. Individuals in the Financial PISA database are selected using a stratified process. Before the random choice of students, there is a random choice of schools. Therefore, students belong to a higher level of aggregation: the schools. In the first level, students provide personal details of themselves and their family. In the second level, head teachers provide information about the centre. The database includes 1,108 students distributed around 179 educational centres. Table A1 in Appendix A provides a detailed description of these variables, and Appendix B presents some of the questions answered in the questionnaire.

Regarding students' information, they fill in a questionnaire about their social and family environment, their personal characteristics, their study habits and their attitudes. The PISA database also provides comprehensive information on the type of school in which they study.

The individual characteristics focus not only on the conventional questions about the student, such as gender and date of birth, but also on factors associated with the individual's personality or psychology, such as self-confidence, perseverance and motivation. Almlund *et al.* (2011) point out the importance of personal psychological factors in obtaining good results in matters to do with money as well as academic, work-related and social areas. Other authors (Bénabou and Tirole, 2002) also highlight the role of self-confidence and motivation in the decisions of individuals.

The non-cognitive skills reflect the emotional characteristics of the individual, which are determined by their own perception of themselves. We construct discrete variables to measure self-confidence (*selfconf*), perseverance (*persever*) and motivation (*motivat*). These variables aggregate the information of several items. We summarise the information of each item such that the variable is increased by 1 if the individual feels identified with high self-confidence, motivation and perseverance, and 0 otherwise.⁵ The distinction between the final letters *a* and *b* for perseverance reflects positive (high) and negative (low) versions of this variable.⁶ These variables contain one or several items and the range of values which all these variables take is listed in Table A1 in Appendix A. For instance, the person who feels identified to a large extent with any of the concepts in version *a* is an individual with a high degree of perseverance. By contrast, the person who identifies to a large extent with the concepts in version *b* is associated with an individual with low perseverance.

Table 1 shows descriptive statistics. The averages for all the participant countries are 500 and 484.25 for boys and girls respectively. For Spain, differences in the results of the financial literacy exam seem to be small on average: 487.18 for boys and 481 for girls. However, a more comprehensive analysis is necessary to assess whether the gender gap, documented by the literature, is also present in Spain.

4: See the technical notes on the OECD's PISA Financial Education programme for a more detailed description of the issues relating to the Financial Literacy PISA project.

5: Depending on whether the item corresponding to each of the questions is formulated in positive/negative form, we adapt the way we construct the discrete variables.

6: On occasion the statements in the questions contain negative messages, so if the student identifies with the statement, the respondent is displaying a low level of the quality under consideration.

In terms of non-cognitive skills, we observe that the levels of perseverance are low in general. In its positive format (*persever1a*), it is close to a third of its maximum value and above 15% in its negative version (*persever1b*). The level of self-confidence (*selfconf*) is also low and the variable for motivation is above 50% of its corresponding maximum. To identify cognitive skills, we incorporate variables based on the academic performance in the past and numeracy skills. Only 20% of students claim to have repeated a year in the middle years of primary school, and 36% of the respondents indicate good grades in mathematics.

Regarding other individual characteristics, the number of men and women is similar (around 53% of individuals are men and 47% are women). Birth dates are evenly distributed across the year. Family characteristics reveal that around 27% of parents have university-level education, while around 36% left school at 15 or 16. Nearly seven out of ten students have a mother working outside the home, and the figure rises to eight in the case of the father. The variable for the number of books in the household tries to measure the taste for reading in the household. Table 1 illustrates that only 36% of students claim to have more than 25 books in their homes⁷. E-books also represent the taste for reading and the household socio-economic status.

Regarding the educational centre, 64% of the students in the database go to state schools. Only a very small proportion of students are at a school where access is based on academic merit (below 8%). The ratio of computers with internet access per student is around 0.6. Finally, it is interesting to note that only 15% of schools provide some kind of specific financial education programme.

B. Methodology

Our estimation process aims to control for the two levels of information mentioned previously, students and schools, by including the weights associated with each level. This nested system applied in PISA prevents conventional linear regression analysis from being used, since the students at the same school share characteristics with their peers. In this context, the classic assumption in regression models - independence of the observations - disappears. We carry out estimations based on a multilevel analysis, in which a hierarchy structure is considered. We distinguish between the first level (students) and the second level (schools).

Our dependent variable is defined by the results obtained by the student in financial competence tests. The structure of PISA prevents the use of a single value as a reference for the student's results, since the latter only replies to a certain number of questions in the entire questionnaire. The replies, together with information on several variables in the questionnaire, yield a distribution of values to be created *a posteriori* for each individual. In total, five random values, called *plausible values*, are obtained from this distribution for each student. The five plausible values must be used in the estimation process in order to avoid problems associated with biases and inefficiency (OECD, 2009). To control for these properties, PISA's database provides eighty replicates of individual weightings, which allow efficient estimators. The use of replicates is necessary because of the way in which individuals are selected from the PISA sample.

When creating the explanatory variables, we avoid eliminating the observations for two reasons. First, we want to avoid skewing the influence of the weightings in the estimates. Interpreting the variables where the information of the individuals is not complete is different from the conventional interpretation. The dummy variable associated with a discrete variable with incomplete information takes value 1 when the individual answers explicitly that they identify themselves fully with the option in the original variable, and 0 otherwise. As such, 0 includes both those people who are excluded under the value 1, as well as those about whom the information is unknown. Second, the "I don't know" (DK) or "I don't want to answer" (DA) responses contain, in and of themselves, relevant information. This information is particularly interesting for the set of variables about self-confidence, persistence and motivation. When answering questions about his/her own view, there is no

7: This variable aims to pin down structural sociocultural variations rather than trends. For this reason, this variable is included in our regressions as well as the availability and use of electronic books (e-books) at home.

one correct or expected answer and, as such, the choice of either of the two options could be a sign of low self-confidence, persistence and motivation. This procedure helps to identify more clearly the idea of self-confidence, taking the respondents who feel identified with this concept, without hesitation, and clearly dividing this group off from the rest. In the sample, the DK/DA weighting in the variables is relatively low.

In our multilevel analysis, students' results depend on their personal and family characteristics, as well as on the characteristics of the school. Bearing in mind that the observations are nested, this type of model allows the inclusion of fixed effects and random effects.

The overall model is expressed as follows (Laird and Ware, 1982):

$$Y_j = X_{1j}\beta_1 + X_{2j}\beta_2 + Z_j\gamma_j + \varepsilon_j$$

$$\varepsilon = [\varepsilon_j]_{j=1,\dots,179}, \quad \varepsilon \sim N(0, \sigma_\varepsilon^2 \Sigma_\varepsilon)$$

where $\gamma = [\gamma_j]_{j=1,\dots,179}$ has a matrix of variances and covariances Σ_γ and this vector is orthogonal to ε .

Let the dependent variable Y_{ij} be the (expected) educational result of the student i in the school j ($j=1,\dots, 179$, where each school includes n_j students in the sample). These results are aggregated in a column vector, Y_j , which includes all the results of the exam ($Y_j = [Y_{ij}]_{i=1,\dots,n_j, j=1,\dots,179}$).

Vector X represents the characteristics associated with the student, and is divided into two subgroups (X_1, X_2). X_1 represents the non-cognitive skills and contains the following variables. The variable *selfconf* refers to self-confidence in a general sense. The variables *persever1a*, *persever1b* and *motivate* account for perseverance and motivation respectively.⁸ The student's remaining characteristics are represented by the vector X_2 . It includes personal characteristics, such as gender, month of birth and cognitive skills (behind the information contained in the possibility of having repeated a course in the previous years and whether the student gets good grades for mathematics: numeracy skills). Family characteristics include the educational level of the parents, and whether or not they work outside the home. Finally, we control for the number of books and e-books within the household. Including family variables is justified in the results shown by Villar (2013) and García-Montalvo (2013). According to these authors, the distribution of students with poorer results is uneven between social groups and they experience significant difficulties in social progress. Moreover, the family environment is confirmed as a factor that needs to be taken into account in the estimation process (Lusardi *et al.*, 2010; Lusardi and Mitchell, 2013).

Vector Z contains characteristics relating to school (identical for all the students in each educational centre), in order to control for the composition effects or group effects stemming from the school itself. The effects of these variables are estimated with random effects.

The parameter vectors β_1 , β_2 and γ contain the coefficients associated with the independent variables. The fixed effects are represented in β_1 and β_2 , and the random effects, at school level, are represented by γ .⁹

8: See Appendix 2 for detailed information on the variable construction of non-cognitive skills.

9: Given the specific conditions of the sample, we carry out the estimates following the indications of the OECD (2009) to obtain accurate estimates and standard deviations.

3 Empirical Results

Table 2 shows the results of the estimated coefficients. We have four different models whose endogenous variable represents the scores in the financial literacy test. We use this variable to proxy the degree of financial literacy of students. Models 1 to 3 are estimated with fixed effects and include individual and family characteristics. Model 4, which controls for the school characteristics, is estimated with random effects. Statistics of individual significance are in brackets and the asterisks denote conventional significance levels.

We start from a base model, Model 1, in which we control for individual characteristics, such as gender and month of birth, and also for cognitive skills that may influence financial literacy. Cognitive aspects include information about whether the student has repeated a year or not (*repeat2*), and information as to whether the student says that he/she has good grades in mathematics (*goodgrma*) to control also for the possible synergies between mathematical and numeracy abilities and financial literacy.¹⁰ In line with the literature, we find a gender gap in favour of men. Thus, women with similar characteristics to men score 12.5 points less on average in the financial literacy exams. Variables to proxy cognitive skills are both significant and with the expected sign. Also, we find a sizeable and positive effect of maturity, but only for students who were born in January with reference to those born in December (almost one year of difference). The former achieve nearly twenty-five points more than those in the reference group (individuals born in December).¹¹

In Model 2, we control for the family context by including information about parents' educational level, parents working outside the home, the number of books at home (which represents the taste for reading in the family environment), and the existence and use of e-books. All the variables have the expected sign, although not all are statistically significant. It is interesting to notice that the variable *book25* is significant and its magnitude is high compared to the rest of the variables. Those students claiming to have more than 25 books at home score nearly 50 points more than the rest in the exam. Having a large number of books at home reflects the taste for reading that might be translated into the interest of the parents in their children's education and other aspects related to social status that have not been directly taken into account. However, having an e-book is a non-significant variable. Regarding the variables related to the family educational level, only the father's education (when it is high) has a significant effect.

In Model 3, we introduce the variables of interest, related to non-cognitive skills (i.e. personal psychology and emotions). As we observe, perseverance and self-confidence are significant at the conventional levels but this is not true for motivation. The gender gap decreases once controlled for the non-cognitive skills. Particularly, the estimate for the effect of gender is 20 per cent lower than those obtained in the previous specifications. Also the significance level of this binary variable is lower. This evidence seems to corroborate the hypothesis that non-cognitive skills also affect performance in the financial literacy test, and helps to explain part of the gender gap in financial literacy.

Selfconf is significant and has a sizeable effect on the test's results. Those students who have high self-confidence score more than 55 points ($11.26 \times 5 \approx 56$), on average, than identical schoolmates. Only the magnitude associated with the effect of having repeated a year in primary school is higher (57.6). This information discriminates among students who may have poor cognitive skills or other important problems. Our results are in line with Bucher-Koenen *et al.* (2012), who attribute gender differences to a problem of self-confidence in financial issues, which also differs by gender.

10: In order to prevent endogeneity in our model, we do not use the scores in reading and maths exams since the direction of causality of these variables is not clear.

11: In Table 2, we do not include the results of the dummy variables from February to October to save space and they are non-significant. This information is available upon request.

The variable which measures perseverance in a negative sense has the expected sign and its effect on the test grade is important (over 13 points). However, perseverance in its positive form (*persever1a*) results in a direction which in principle appears unexpected, but can be justified by the psychology theory. This variable, *persever1a*, may be reflecting issues such as the perverse effects of perfectionism, which could lead to irrational behavioural patterns (Bénabou and Tirole, 2002; Bénabou and Tirole, 2003).¹² Our hypothesis is that there may be some kind of decreasing returns to scale in this variable, which means that high levels of persistence lead to worse results. Persistence taken to extremes can generate irrational behaviour, giving rise to poorer results. To control for this hypothesis, we include non-linear specifications in our models. However, we are not able to capture this feature.¹³ Another possible explanation may be the fact that the percentage of individuals who claim to identify to a large extent with statements denoting this quality is comparatively higher than for the *persever1b* variable. They represent between 25% and 35% of the total sample for *persever1a*, compared to 11% for *persever1b*. An alternative explanation is given by the overestimation of an individual's own abilities (Akerlof and Dickens, 1982; Bénabou and Tirole, 2002).

To reinforce the robustness of our results, we include random effects associated with the school. Model 4 illustrates the specification in Model 3, together with the variables referring to the school, which enter the model via random effects. Neither the magnitude of the fixed effects coefficients nor their significance show major changes from the results in Model 3.

12: Also, the positive self-qualification of individual work capacity and perfection may hide an intention to give positive messages about him/herself (despite the anonymity of the test) or the person's own overestimation of their successful experiences as against the negative ones (cognitive dissonance).

13: Results are available upon request.

4 Conclusions and Policy Implications

The literature documents that gender differences in financial literacy are persistent and widespread. We focus on young people to study factors behind the gender gap in financial literacy at early stages of life.

Our paper contributes to the literature on gender gap in financial literacy by investigating the differences between boys and girls (when 15 years old) in this matter. We focus on young people, 15-year-old students in Spain, to disentangle whether women know less about finance from the start of the life-cycle than men do. We show the effects of non-cognitive skills (self-confidence, motivation and perseverance) in explaining differences between boys and girls in financial knowledge. Our findings corroborate the hypothesis that self-confidence, perseverance and motivation affect financial literacy and explain part of the gender gap. We show that accounting for these non-cognitive skills decreases the differences between boys and girls in financial literacy by 20 per cent.

Observed gender differences in financial literacy are present not only among adults but also among young people. Moreover, studies from several countries show that financial illiteracy is not only pervasive, but that it is particularly severe for women. This is particularly worrisome because they need to deal with particularly specially challenging circumstances. Women have different saving needs because they tend to live longer than men, have shorter working lives (i.e. women have less attachment to the labour market, with interrupted careers because of maternity), have lower wages than men and are likely to spend part of their retirement as widows. Thus, women are at risk of having inadequate retirement resources and of living their final years in poverty. Women are more likely to make important and daily decisions about the allocation of household resources. In addition, they are likely to take primary responsibility for childrearing and to have a major role in the transmission of financial habits and skills to their children. In this context, increasing financial education is needed not only to improve women's management of their personal and household finances, but also to empower them to choose and access appropriate financial services and products, as well as to develop and manage entrepreneurial activities.

Evidence on the role of non-cognitive skills should be taken into account for policymakers to both increase financial literacy and reduce the gender gap. Less confidence in individual's financial knowledge and being less interested in financial literacy topics may be responsible for the gender gap in financial literacy, since non-cognitive skills have a sizeable effect on the test results for students in Spain. Policies should be designed by bearing in mind that cognitive skills alone do not explain an individual's financial decision making, but are only part of the story.

References

- Akerlof, G. and Dickens, W. (1982), "The economic consequences of cognitive dissonance", *American Economic Review*, 72, 307-319.
- Almenberg, J. and Säve-Söderbergh, J. (2011), "Financial Literacy and Retirement Planning in Sweden", Netspar Discussion Paper No. 01/2011-018.
- Almlund, M., Duckworth, A. L., Heckman, J. J. and Kautz, T. D. (2011), "Personality psychology and economics", *NBER Working Paper*, No. 16822. Cambridge, MA: National Bureau of Economic Research.
- Arellano, A., Cámara, N. and Tuesta, D. (2014), "The effect of self-confidence on financial literacy". *BBVA Research Working Paper*, N° 14/28, October 2014, Madrid.
- Bénabou, R and Tirole, J. (2002), "Self-confidence and personal motivation", *The Quarterly Journal of Economics*, 117 (3), 871-915.
- Bénabou, R and Tirole, J. (2003), "Intrinsic and extrinsic motivation", *The Review of Economics Studies*, 70 (3), 489-520.
- Bucher-Koenen, T., Lusardi, A., Alessie, R., and van Rooij, M. (2012), "How financially literate are women? Some new perspectives on the gender gap", *Netspar Panel Paper*, No. 31.
- Chen, H. and Volpe, R. (1998), "An analysis of personal financial literacy among college students", *Financial Services Review*, 7 (2), 107-128.
- Croson, R. and Gneezy, U. (2009), "Gender Differences in Preferences", *Journal of Economic Literature*, 47(2), 1-27.
- Fonseca, R., Mullen, K. J., Zamarro, G., and Zissimopoulos, J.. (2012), "What explains the gender gap in financial literacy? The role of household decision making", *Journal of Consumer Affairs*, 46 (1), 90-106.
- Ford, M. W., and Kent, D. W. (2009), "Gender differences in student financial market attitudes and awareness: An exploratory study", *Journal of Education for Business*, 85 (1), 7-12.
- García Montalvo, J. (2013), "Crisis, igualdad de oportunidades y resultados educativos: una comparación temporal de pisa con los resultados de 2012 en España", in INEE (Ed.), *PISA 2012: Programa para la evaluación internacional de los alumnos. Informe español*. Volumen II: Análisis secundario. Madrid, 2013.
- Goldsmith, E., and Goldsmith, R. E. (1997), "Gender differences in perceived and real knowledge of financial investments", *Psychological Reports*, 80 (1), 236-238.
- Hilgert, M. A., Hogarth, J. M. and Beverly, S. G. (2003), "Household financial management: The connection between knowledge and behavior", *Federal Reserve Bulletin*, 89 (7), 309-322.
- Hsu, H. C. (2005), "Gender disparity of successful aging in Taiwan", *Women & health*, 42 (1), 1-21.
- Klapper, L. and Panos, G.A. (2011), "Financial literacy and retirement planning: the Russian case," *Journal of Pension Economics and Finance*, Cambridge University Press, vol. 10(04), 599-618, October.
- Laird, N. M. and Ware, J. H. (1982), "Random-effects models for longitudinal data", *Biometrics*, 38, 963-974.
- Lusardi, A. and Mitchell, O. (2009), "How ordinary consumers make complex economic decisions: Financial literacy and retirement readiness", *NBER Working Paper*, No. 15350. Cambridge, MA: National Bureau of Economic Research.

Lusardi, A., Mitchell, O. S., and Curto, V. (2010), "Financial literacy among the young: Evidence and implications for consumer policy", CFS Working Paper, No. 2010/09, Center for Financial Studies, Goethe-Universität Frankfurt.

Lyons, A. C., Palmer, L., Jayaratne, K. S., and Scherpf, E. (2006), "Are we making the grade? A national overview of financial education and program evaluation", *Journal of Consumer Affairs*, 40 (2), 208-235.

Mahdavi, M., and Horton, N. (2012), "Financial Literacy among Educated Women: Room for Improvement", Working Paper, Smith College.

Mandell, L. (2006), "Financial literacy: If it's so important, why isn't it improving", Networks Financial Institute Policy Brief 2006-PB, 8.

Mandell, L. (2008), Financial education in high school. Overcoming the saving slump: How to increase the effectiveness of financial education and saving programs, 257-279. Chicago, IL: University of Chicago Press.

Mandell, L. (2009, January). The impact of financial education in high school and college on financial literacy and subsequent financial decision making. In American Economic Association meetings, San Francisco, CA.

Villar, A. (2013), "Rendimiento, esfuerzo y productividad: Análisis de los resultados en matemáticas de los estudiantes españoles según PISA (2012)", in INEE (Ed.), PISA 2012: Programa para la evaluación internacional de los alumnos. Informe español. Volumen II: Análisis secundario. Madrid, 2013.

A Appendix

Table A.1

Description of the variables

| Student: St Questionnaire PISA 2012 | | | |
|-------------------------------------|-----------------------------|---------------------|--|
| selfconf | ST94Q05, Q06, Q09, Q10, Q14 | Q51-Form B | Discrete quantitative variable – Self-confidence |
| persever1a | S93Q04, 06, 07 | Q28-Form A | Discrete quantitative variable- Motivation |
| persever1b | S93Q01, 03 | Q28-Form A | Discrete quantitative variable- Motivation |
| motivat | S89Q04 | Q39-Form B | Dummy (1/0) Motivation |
| woman | ST04 | Q4-Form A, B and C | Dummy: 1 if the individual is a woman and 0 otherwise |
| January | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in January and 0 otherwise |
| February | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in February and 0 otherwise |
| March | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in March and 0 otherwise |
| April | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in April and 0 otherwise |
| May | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in May and 0 otherwise |
| June | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in June and 0 otherwise |
| July | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in July and 0 otherwise |
| August | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in August and 0 otherwise |
| September | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in September and 0 otherwise |
| October | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in October and 0 otherwise |
| November | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in November and 0 otherwise |
| December | ST03Q01 | Q3-Form A, B and C | Dummy: 1 if the individual was born in December and 0 otherwise |
| repeat2 | ST07Q02 | Q7-Form A, B and C | Dummy: 1 if the individual repeated a year in the first phase of secondary education and 0 otherwise |
| goodgrma | ST42Q04 | Q44-Form B | Dummy: 1 if the individual claims to have good grades in mathematics and 0 otherwise |
| Family: St Questionnaire PISA 2012 | | | |
| himoted | ST14Q01, Q02, Q03 | Q15-Form A, B and C | Dummy: 1 if the mother has tertiary education and 0 otherwise |
| hifated | ST18Q01, Q02, Q03 | Q20-Form A, B and C | Dummy: 1 if the father has tertiary education and 0 otherwise |
| lomoted | ST13Q01 | Q15-Form A, B and C | Dummy: 1 if the mother completed first phase of secondary education or less and 0 otherwise |
| lofated | ST19Q01 | Q20-Form A, B and C | Dummy: 1 if the father completed first phase of secondary education or less and 0 otherwise |
| motwork | ST15 | Q16-Form A, B and C | Dummy: 1 if the mother works outside the home and 0 otherwise |
| book25 | ST28Q01 | Q27-Form A, B and C | Dummy: 1 if there are more than 25 books in the individual's home and 0 otherwise |
| fatwork | ST19 | Q21-Form A, B and C | Dummy: 1 if the father works and 0 otherwise |
| School: Sc Questionnaire PISA 2012 | | | |
| finaninf | SC47 | | Dummy: 1 if the school offers financial education courses and 0 otherwise |
| admcomp | SC32Q01 | | Dummy: 1 if the school has an academic admission policy and 0 otherwise |
| ratio0 | SC11Q03/SC11Q01 | | Ratio of computers with internet access per child |
| state | SC01 | | Dummy: 1 if the school is state-sector and 0 otherwise |

Source: PISA Database (2012)

B Appendix: Questions about the variables of interest

Source: PISA database (2012)

About your problem solving experiences

Q51 How well does each of the following statements below describe you?

Please tick only one box in each row: Very much like me, mostly like me, somewhat like me, not much like me, not at all like me.

- a) I can handle a lot of information.
- b) I am quick to understand things.
- c) I seek explanations for things.
- d) I can easily link facts together.
- e) I like to solve complex problems.

Persistence

Q36 How well does each of the following statements below describe you?

Please tick only one box in each row: Strongly agree, Agree, Disagree, Strongly disagree

- a) When confronted with a problem, I give up easily.
- b) I put off difficult problems.
- c) I remain interested in the tasks that I start.
- d) I continue working on tasks until everything is perfect.
- e) When confronted with a problem, I do more than what is expected of me.

Motivation

Q39 Thinking about your school: to what extent do you agree with the following statements?

Please tick only one box in each row: Strongly agree, Agree, Disagree, Strongly disagree

- d) Trying hard at school is important.

Tables

Table 1

Descriptive statistics of the variables

| Variable | Average | Standard Dev. | Min | Max | Num. Obs. |
|--|---------|---------------|-----|-------|-----------|
| Student: St Questionnaire PISA 2012 | | | | | |
| selfconf | 1.736 | 1.859 | 0 | 5 | 1,108 |
| persever1a | 0.992 | 1.176 | 0 | 3 | 1,108 |
| persever1b | 0.315 | 0.618 | 0 | 2 | 1,108 |
| motivat | 0.613 | 0.487 | 0 | 1 | 1,108 |
| woman | 0.472 | 0.499 | 0 | 1 | 1,108 |
| January | 0.064 | 0.245 | 0 | 1 | 1,108 |
| February | 0.073 | 0.26 | 0 | 1 | 1,108 |
| March | 0.088 | 0.283 | 0 | 1 | 1,108 |
| April | 0.084 | 0.277 | 0 | 1 | 1,108 |
| May | 0.099 | 0.299 | 0 | 1 | 1,108 |
| June | 0.077 | 0.266 | 0 | 1 | 1,108 |
| July | 0.088 | 0.283 | 0 | 1 | 1,108 |
| August | 0.072 | 0.259 | 0 | 1 | 1,108 |
| September | 0.097 | 0.297 | 0 | 1 | 1,108 |
| October | 0.079 | 0.271 | 0 | 1 | 1,108 |
| November | 0.095 | 0.293 | 0 | 1 | 1,108 |
| December | 0.084 | 0.277 | 0 | 1 | 1,108 |
| repeat2 | 0.232 | 0.422 | 0 | 1 | 1,108 |
| goodgrma | 0.363 | 0.481 | 0 | 1 | 1,108 |
| Family: St Questionnaire PISA 2012 | | | | | |
| himoted | 0.284 | 0.451 | 0 | 1 | 1,108 |
| hifated | 0.263 | 0.440 | 0 | 1 | 1,108 |
| lomoted | 0.347 | 0.476 | 0 | 1 | 1,108 |
| lofated | 0.376 | 0.485 | 0 | 1 | 1,108 |
| motwork | 0.653 | 0.476 | 0 | 1 | 1,108 |
| book25 | 0.356 | 0.479 | 0 | 1 | 1,108 |
| fatwork | 0.804 | 0.397 | 0 | 1 | 1,108 |
| School: Sc Questionnaire PISA 2012 | | | | | |
| finaninf | 0.149 | 0.356 | 0 | 1 | 1,108 |
| admcomp | 0.076 | 0.265 | 0 | 1 | 1,108 |
| ratio0 | 0.587 | 0.372 | 0 | 2.857 | 1,108 |
| state | 0.638 | 0.481 | 0 | 1 | 1,108 |

Source: PISA Database (2012)

Table 2

Financial education among the Young: the case of Spain

| Variables | Model 1 | Model 2 | Model 3 | Model 4 |
|----------------|--------------------------|--------------------------|-------------------------|-------------------------|
| woman | -12.5384 ** (-2.25) | -13.422 ** (-2.42) | -10.4602 * (-1.95) | -10.3556 * (-1.92) |
| month1 | 24.88025 ** (2.06) | 23.75524 ** (2.02) | 20.33669 * (1.74) | 21.45246 * (1.84) |
| ... | ... | ... | ... | ... |
| month11 | 3.922175 (0.35) | 2.840093 (0.26) | 1.988052 (0.19) | 3.059065 (0.29) |
| repet2 | -72.1884 *** (-11.82) | -59.3129 *** (-9.60) | -57.9566 *** (-9.41) | -57.6047 *** (-9.44) |
| goodgrma | 12.21724 ** (2.50) | 11.28115 ** (2.35) | 9.628082 * (1.74) | 9.085315 * (1.65) |
| motedup | | 11.13032 (1.25) | 8.555827 (0.95) | 8.087782 (0.90) |
| moteddo | | 5.576998 (0.74) | 8.058917 (1.04) | 8.166499 (1.05) |
| fatedup | | 15.95236 * (1.78) | 19.40069 ** (2.26) | 18.97013 ** (2.23) |
| fateddo | | -3.50669 (-0.44) | -1.16491 (-0.15) | -1.05731 (-0.14) |
| famoedup | | -15.1845 (-1.07) | -17.4108 (-1.26) | -17.1049 (-1.27) |
| famoeddo | | -8.27339 (-0.75) | -9.7843 (-0.87) | -10.1436 (-0.90) |
| motwork | | 9.354555 (1.61) | 6.356088 (1.13) | 6.026118 (1.08) |
| fatwork | | 3.048419 (0.42) | 4.946168 (0.72) | 5.018704 (0.73) |
| book25 | | 49.08418 *** (6.98) | 40.84213 *** (5.67) | 40.36483 *** (5.57) |
| ebook1 | | -1.5941 (-0.22) | -2.14583 (-0.32) | -1.17447 (-0.17) |
| selfconf | | | 11.03635 *** (6.51) | 11.26083 *** (6.63) |
| persever1a | | | -5.1828 ** (-2.26) | -5.70472 ** (-2.43) |
| persever1b | | | -13.7733 *** (-3.62) | -13.6521 *** (-3.62) |
| motivat | | | 6.131909 (0.96) | 6.63659 (1.05) |
| constante | 498.3748 *** 57.37287 | 449.8461 *** 32.19768 | 441.3948 *** (31.04) | 443.4999 *** (31.14) |
| Random effects | No | No | No | Si |
| Students | 1.108 | 1.108 | 1.108 | 1.108 |
| Schools | 179 | 179 | 179 | 179 |

Notes: ***, **, * denote ratios significant to 1%, 5% and 10% respectively. The values in brackets are statistics with individual significance.
Source: PISA (2012) database

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